

LARVA, PUPA, AND ADULTS OF *GLOSSOSOMA NIGRIOR* (TRICHOPTERA: GLOSSOSOMATIDAE) WITH A REVIEW OF THE EASTERN NORTH AMERICAN SPECIES OF *GLOSSOSOMA*¹

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ABSTRACT: The three eastern North American species of the genus *Glossosoma* are reviewed with a new description for the male, female, pupa, and larva of *Glossosoma nigrrior*. New characters are presented to distinguish the larva of *G. nigrrior* from that of *G. intermedium*, and illustrated keys are provided to distinguish males, females, and larvae of these two species and *G. lividum*.

The genus *Glossosoma* Curtis, 1834, is represented in eastern North America by three species, *G. intermedium* (Klapálek, 1892), *G. lividum* (Hagen, 1861), and *G. nigrrior* Banks, 1911, all of which are in the subgenus *Eomystra* Martynov, 1934. These three species are widespread in eastern North America (Fig. 1). *Glossosoma intermedium* is restricted to more-northern locations (Fig. 1A). *Glossosoma lividum* has been reported only from Vermont, Massachusetts, New York, and Tennessee (Fig. 1B). A record of *G. lividum* from either North Carolina or South Carolina by Unzicker et al (1982) is unconfirmed. *Glossosoma nigrrior* is distributed over both of these ranges as well as more-southern locations (Fig. 1C). Figure 1 was compiled from information published by Leonard and Leonard (1949), Ellis (1962), Hilsenhoff et al (1972), Longridge and Hilsenhoff (1973), Resh (1975), Etnier and Schuster (1979), Wimmer (1979), Masteller and Flint (1980), Anderson (1981), Parker and Voshell (1981), Penrose et al (1982), Huryh and Foote (1983), Vinikour et al (1983), Harris et al (1984), Lake (1984), Steven and Hilsenhoff (1984), Glazier and Gooch (1987), Garono and MacLean (1988), Floyd and Schuster (1990), Harris and Lago (1990), and Tarter (1990). Despite their widespread occurrence there is no reliable key for separating the larvae or the adults of these species.

Kimmins (1943) produced descriptions and illustrations of the larva and case of *G. intermedium* (as *Mystophora intermedia*). Additional descriptions of the *G. intermedium* larva were provided by Ross (1944), Hickin (1967), Mackereth (1956), and Lepneva (1964, as *M. intermedia*). The adults of *G. intermedium* were redescribed by Ross (1944, 1956), Unzicker (1968), Nimmo (1974), and Schmid (1982).

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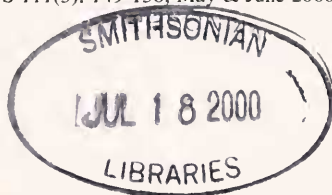


Figure 1



Fig. 1, Collection locations for *Glossosoma* species in eastern North America: A, *G. intermedium*; B, *G. lividum*; C, *G. nigrior*.

Glossosoma americanum Banks, 1897, was synonymized with *G. lividum* by Ross (1965). Betten (1934) and Schmid (1980, 1982, 1998) redescribed and illustrated the male. Descriptions and illustrations of the larva and case of *G. lividum* were given by Lloyd (1921) and of its pupa by Sibley (1926) as *G. americanum* and *M. americanum*, respectively.

Eomystra unica Denning, 1942, was synonymized with *G. nigrior* by Ross (1944). Descriptions of the larva and pupa of *G. nigrior* were provided by Neubauer and Robertson (1985) along with a key for larvae which we have found to be unreliable.

Specimens examined for this study were borrowed from A.P. Nimmo, University of Alberta, Edmonton (APN); The Royal Ontario Museum, Toronto (ROM), The Frost Museum, Pennsylvania State University (FM); the Illinois Natural History Survey, Urbana (INHS), the University of Minnesota Insect Collection (UMN), and the Clemson University Arthropod Collection, Clemson, South Carolina (CUAC).

Glossosoma nigrior Banks

Glossosoma nigrior Banks, 1911 ("1910"), p. 355, pl. 13 fig. 23; lectotype male (Type 11745) and lectoallotype female at the Harvard Museum of Comparative Zoology, Cambridge, Massachusetts (Ross, 1938); type locality — "Black Mountain, North Carolina, north fork of the Swannanoa River, May."

Eomystra unica Denning, 1942, pp. 46-48, pl. 6 figs. 1-1B (synonymy by Ross, 1944, p. 292).

Male: Length from front of head to tip of folded wings 7.4-7.6 mm (n=9). Forewings 5.9-6.1 mm (n=9, Fig. 2A). Hindwings 3.9-4.1 mm (n=9, Fig. 2B). Specimens in alcohol with dorsum of head and thorax light to medium brown. Thoracic venter and appendages light brown to yellow. Abdomen light brown to yellow with slightly darker genitalia. Forewings and hindwings uniformly dark brown. Maxillary and labial palps much longer than head is wide. Antennae extending to apex of abdomen. Inner apical tibial spur on each hind tibia flattened and sharply hooked (Fig. 2C). Abdominal segment IX with tergum light brown, broad dorsally, tapering ventrally to short, transverse sternal band (Fig. 2F). Inferior appendages broad basally, divided apically into two long branches. Dorsal branch slender, setose, slightly sinuous; ventral branch bare in distal half with acute tip curved slightly dorsad and mesad (Fig. 2F).

Female: Length from front of head to tips of folded wings 8.5-8.7 mm (n=10). Forewings 7.7-7.0 mm (n=10). Hindwings 4.2-4.4 mm (n=10). Coloration and general structure resembling that of male. Tibia and basitarsus of each mesothoracic leg much broader than in males, and concave posteriorly. Tibial spurs unmodified. Abdominal segment VIII lobed posterolaterally (Fig. 3B), deeply and broadly incised ventrally and dorsally (Figs. 3C and 3D, respectively). Segment IX evidenced only by pair of internal apodemes articulating externally with anterolateral corners of tergum X (Schmid, 1982), long membranous region anterior of tergum X and segment XI (Fig. 3A); cerci 1-segmented, dark brown distally, spermathecal sclerite elongate, oval (Fig. 3E).

Pupa: Length 5-6 mm (n = 14). Pupal cocoon reddish-brown, cigar-shaped. Pupal and larval case dome-shaped dorsally (Fig. 4E). Larval case modified for pupation by removal of transverse ventral strap, with dome-shaped dorsal portion firmly attached to rock substrate. Head medium brown with dark brown mandibles. Light yellow stripe connecting antennal bases. Mandibles each serrate on inner surface, one prominent median tooth with inconspicuous tooth at its base (Fig. 2D). Antennae curving around head posterior to eyes and extending along ventrolateral margins of body to abdominal segment VII or VIII. Tibial spurs 2-4-4, mid-tibial

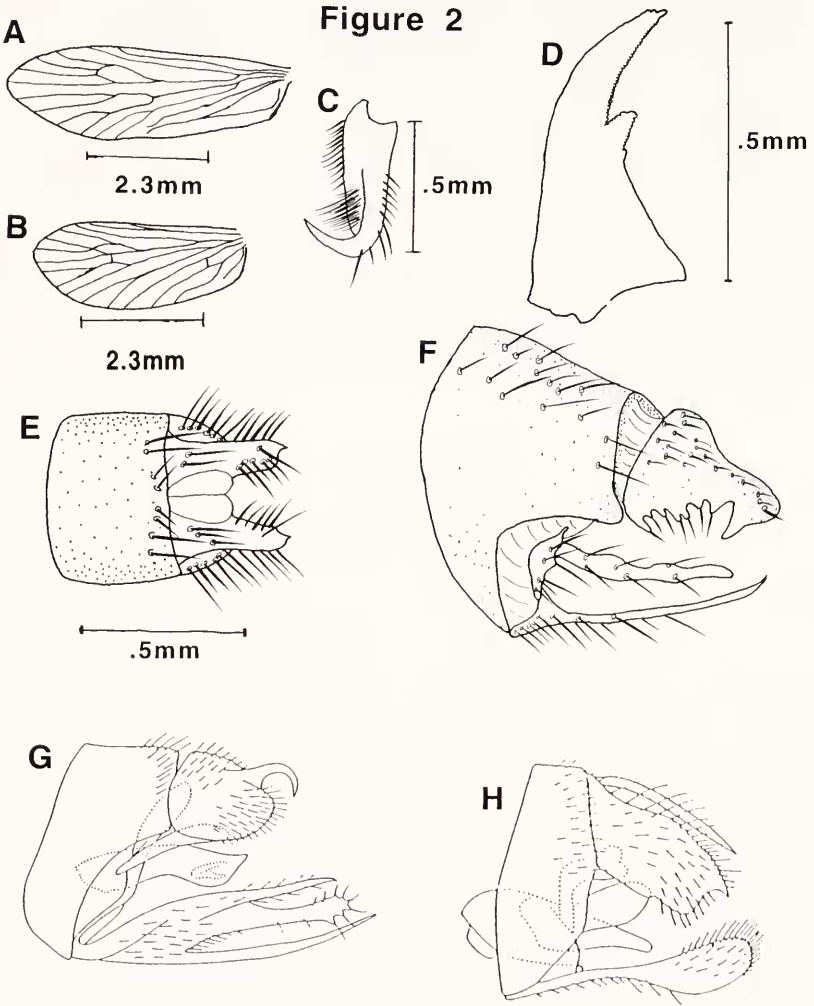


Fig. 2, Characters of *Glossosoma* species males and pupa: A-F, *G. nigrior*; G, *G. lividum*; H, *G. intermedium*. A, right forewing, dorsal view; B, right hindwing, dorsal view; C, right inner apical spur, lateral view; D, left pupal mandible, dorsal view; E, genitalia, dorsal view; F, genitalia, left lateral view; G, genitalia, left lateral view (From Schmid, 1982); H, genitalia, left lateral view (From Schmid, 1982).

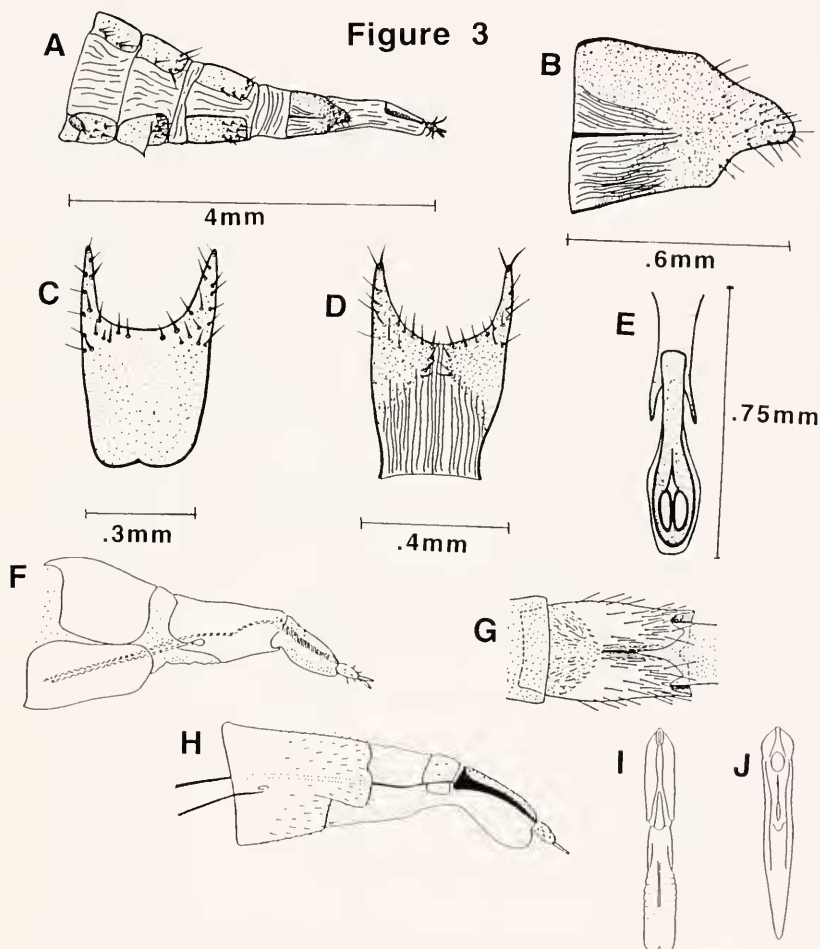


Fig. 3. Characters of *Glossosoma* species females: A-E, *G. nigrior*; F-G, *G. intermedium*; H-I, *G. lividum*. A, abdominal segments V-XI, left lateral view; B, abdominal segment VIII, left lateral view; C, abdominal segment VIII, dorsal view; D, abdominal segment VIII, ventral view; E, spermathecal sclerite, ventral view; F, abdominal segments VII-X, left lateral view (From Ross, 1944); G, abdominal segment VIII, ventral view (From Ross, 1944); H, abdominal segments VIII-X, left lateral view (From Schmid, 1982); I, spermathecal sclerite, ventral view (From Schmid, 1982); J, spermathecal sclerite, ventral view (From Schmid, 1982).

and hind-tibial spurs about one-quarter length of tibia, fore-tibial spur much shorter. Male pupa with inner apical spur of each hind tibia flattened and sharply hooked (Fig. 2C). Abdomen dorsally medium brown mottled with light tan ventrally. Anterior dorsal hook plates on segments III-IX and posterior dorsal hook plates on terga IV and V. Very lightly sclerotized terminal segment with two tufts of setae, each with three setae about as long as terminal segment.

Larva: Length 4-5 mm (n=20). Body cylindrical and somewhat C-shaped. Case made of small stones, top dome-shaped, ovoid; floor open ventrally near either end with flat mid-ventral strap transversely connecting long sides of oval (Fig. 4E). Head moderately dark brown with light brown mottling. Epicranial suture and frontal sutures light in color and highly visible. Light yellow patch around eye extending posteroventrad. Leading edge of frontoclypeus slightly to strongly notched (Fig. 4A). Pronotum heavily sclerotized with small black spot on each anterolateral margin just above forecoxa and with black mark on each posterolateral margin (Fig. 4C). Meso- and metanota entirely membranous. Thoracic legs medium brown with black margins. Small dark sclerite in intersegmental fold posterior of each meso- and metathoracic epimeron (Fig. 4H). Tarsal claws each with basal seta on short pedicel, seta extending nearly to tip of claw (Fig. 4F). Abdomen membranous and light-colored except for dark brown, sclerotized tergite IX and anal prolegs. Tergite IX with five pairs of setae posteriorly (Fig. 4G). Anal opening with long, dark, sclerotized, vertical bar on each side. Anal prolegs each with four long setae distally (Fig. 4G). Anal proleg claws each with accessory hook dorsally and small ventral process directed basad (Fig. 4D).

Key To Larvae Of Eastern *Glossosoma* spp.

- 1 Pronotum with small black spot above forecoxa (Fig. 4C) 2
- 1' Pronotum without small black spot above forecoxa
(Lloyd 1921, fig. 193)..... *G. lividum*
- 2 Intersegmental fold between thorax and abdomen posterior
of each metathoracic epimeron with small sclerite (Fig. 4H)..... *G. nigrior*
- 2' Intersegmental fold between thorax and abdomen posterior
of each metathoracic epimeron without small sclerite *G. intermedium*

Key To Adult Males Of Eastern *Glossosoma* spp.

- 1 Inferior appendages each single, clavate (Fig. 2H)..... *G. intermedium*
- 1' Inferior appendages each with two or more branches 2
- 2 Inferior appendages each with two branches; preanal
appendages each with irregular incision in posteroventral margin
and without dorsal hook (Fig. 2F) *G. nigrior*
- 2' Inferior appendages each with three branches; preanal
appendages not incised posteroventrally, but each with
hook dorsally (Fig. 2G)..... *G. lividum*

Key To Adult Females Of Eastern *Glossosoma* spp.

- 1 Abdominal segment VIII broadly and deeply incised
posterodorsally and posteroventrally, lobed posterolaterally
(Figs. 3C, 3D); spermathecal sclerite clavate (Fig. 3E) *G. nigrior*
- 1' Abdominal segment VIII not incised dorsally and with quadrate
or acute incision posteroventrally; spermathecal sclerite not
clavate (Figs. 3I, 3J) 2
- 2 Abdominal segment VIII with broad, nearly quadrate incision
posteroventrally (Fig. 3H); spermathecal sclerite rectangular (Fig. 3I) *G. lividum*
- 2' Abdominal segment VIII with deep narrow cleft posteroventrally
(Fig. 3G); spermathecal sclerite tapered (Fig. 3J)..... *G. intermedium*

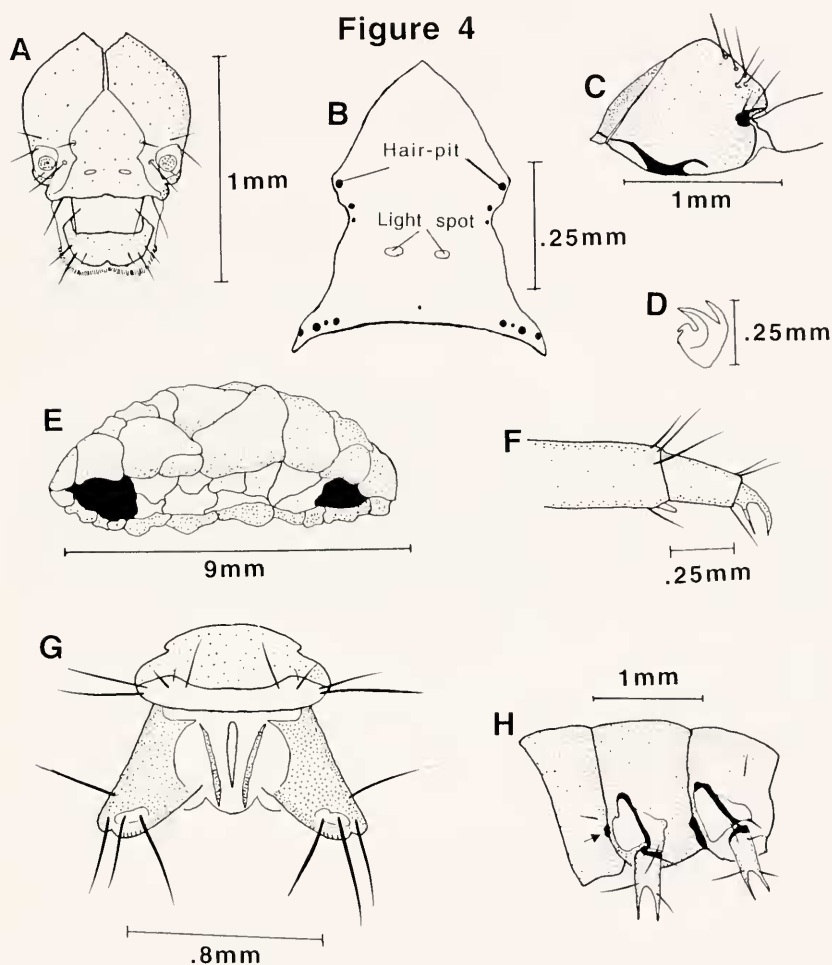


Fig. 4. Characters of *G. nigrior* larva: A, head capsule, dorsal view; B, frontoclypeus showing hair-pit arrangement and light spots, dorsal view; C, pronotum, right posterodorsolateral view; D, right anal proleg claw, lateral view; E, larval case, ventrolateral view; F, tarsus and claw of right foreleg, right lateral view; G, abdominal segments IX and X and anal prolegs, caudal view; H, meso- and metathorax and abdominal segment I, right lateral view.

MATERIAL EXAMINED

Glossosoma nigrrior: South Carolina, Pickens County — Clemson Experimental Forest, Wildcat Creek, 34.75° N, 82.83° W: 5M, 3F, 10P, 14L (CUAC); unnamed tributary to Seneca River, 2.4 km east of Old Central Road, 2L (CUAC). North Carolina, Haywood County — Creek at Big Creek Road, 35.67° N, 83.00° W: 4M, 8F, 6P (CUAC); Macon County — Shope Creek nr. Coweeta Hydrologic Lab: 1L, 4P (ROM). Kentucky, Lyon County — Cannon Spring, 3L (CUAC). Ontario, Algoma District — Chippewa River at Rt. 17E, Batchawana Provincial Park. 3P, 3L (ROM).

Glossosoma lividum: Ontario, Thunder Bay — Tributary of Coldwater Creek, nr. Dorion: 1P, 2L (ROM); Sturgeon River at Rt. 11, 17.6 km NE of Jellicoe: 8P (ROM).

Glossosoma intermedium: Pennsylvania, Centre County — Upper Spruce Creek: 4P, 6L (FM); Steel Hollow Run, 4.8 km NW of Julian: 3L (FM). Maryland, Garrett County — River beside road, ca. 2.4 km E of Friendsville: 6P, 9L (FM). Minnesota, Hennepin County — Bass Pond: 7P (UMN). Ontario, Algoma District — Small stream at Rt. 17, 25.4 km SE of Batchawana Provincial Park: 1P, 8L (ROM). Alberta — Creek 24 km south of Hanging Stone River at Hwy. 63: 8M, 10F (APN).

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